SUMMARY OF DRAFT BIOLOGICAL OPINION ON POLLOCK AND ATKA MACKEREL FISHERIES IN THE BERING SEA/ALEUTIAN ISLANDS REGION AND GULF OF ALASKA

PURPOSE AND CONSULTATION HISTORY

Section 7(a)(2) of the Endangered Species Act, 16 U.S.C. § 1534, et. seq., requires that each Federal agency shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species. When the action of a Federal agency may adversely affect a protected species, that agency is required to consult with either the National Marine Fisheries Service or the U.S. Fish and Wildlife Service, depending upon the protected species that may be affected. The protected species of concern include listed cetaceans, salmon, seabirds, and the Steller sea lion.

DESCRIPTION OF THE PROPOSED ACTIONS

This consultation focuses on three fisheries actions and their potential effects on the western population of Steller sea lions. Those actions, and the reasons for consulting are:

- *Authorization of an Atka mackerel fishery under the Bering Sea/Aleutian Island (BSAI) Groundfish Fishery Management Plan (FMP) between 1999 and 2002*. Consultation on this fishery was initiated because of new information indicating fishery-induced localized depletion of Atka mackerel stocks that could have a detrimental effect on the foraging of Steller sea lions or other protected species.

- *Authorization of a walleye pollock fishery under the BSAI groundfish FMP between 1999 and 2002*. Consultation on this fishery was initiated because of a new scheme for allocation of pollock TAC to inshore/offshore sectors of the fishery. The implementation of the pollock fishery under this allocation scheme may also have a detrimental effect on foraging of Steller sea lions or other protected species.

- *Authorization of a walleye pollock fishery under the Gulf of Alaska (GOA) groundfish FMP between 1999 and 2002*. Consultation on this fishery was initiated because the last completed consultation expires at the end of 1998, and this fishery may compete with Steller sea lions or other protected species.

This section of the opinion provides descriptive background information on the BSAI Atka mackerel fishery and pollock fisheries in the BSAI and GOA. For each species, subtopics include the distribution and life history, trends in biomass, overview of the fishery (distribution of effort, methods, catch history, age-size-sex structure of the stock and the catch, bycatch), fishery management and the setting of harvest parameters (stock assessment and the stock

assessment model, setting the TAC, allowance for other marine predators, and the action area (the extent of the area over which the fishery may exert either a direct or indirect effect).

For the Atka mackerel fishery, a description is provided on the evidence of localized depletion. For the pollock fisheries, the inshore/offshore allocations are described. This descriptive information is generally available in Council documents such as the Stock Assessment and Fishery Evaluation (SAFE) documents or various environmental assessments (EA) prepared for management of the fisheries.

STATUS OF THE SPECIES

The purpose of this section is to describe the status of the Steller sea lion. Seabirds are considered in a separate biological opinion being conducted by the Fish and Wildlife Service. Salmon are being considered by the Northwest Regional Office, NMFS. Cetaceans were considered, but are not included further in the opinion as they were judged not likely to be adversely affected by the fisheries actions in question.

For Steller sea lions, the description includes the life history information (distribution, annual cycle, reproduction, survival, age distribution, foraging patterns [methods of study, foraging distributions, foraging depths, prey energetics and nutrition], natural predators and competitors, disease), population dynamics (biogeography, population status and trends, population variability and stability, population projections), and listed status. Critical habitat is described, with emphasis on the prey resources that comprise the most important biological features of critical habitat. In essence, the marine areas designated as critical habitat for the Steller sea lion were designated as such largely because they contain the prey resources necessary for the conservation of the species.

Of these descriptive subtopics, those on population status and trends, and on foraging patterns are probably the most important for the purposes of this consultation. With respect to population status and trends, the western population has declined by 80% or more throughout much of its range, and the latest counts indicate that the declining trend continues. Decreased juvenile survival appears to be a key element of the decline, although evidence from the 1970s and 1980s also indicates a decrease in reproductive effort.

With respect to foraging patterns, the opinion describes methods for studying Steller sea lions, a summary of their foraging distribution and depths, prey, and energetics and nutrition. The emerging picture suggests 1) Steller sea lions consume a variety of demersal and pelagic prey, 2) pollock and Atka mackerel are both important prey items, with varying importance for sea lions in different areas, 3) sea lion foraging patterns vary by size and sex class, 4) their foraging distributions vary by season, 5) for the animals in the initial studies, the majority of their dives

appear to be relatively shallow, 6) their prey requirements likely vary by season, 7) intraspecific competition may be limited by dispersal of adult males and females during the non-reproductive part of the year and by wide dispersal of juveniles after weaning, 8) nearshore waters may be particularly important during the reproductive season when lactating females are limited by the nutritional requirements of their pups, 9) the transition by young animals from dependence on their mothers to independent feeding may require months to years, and 10) diversity of prey may be essential to population stability and growth.

ENVIRONMENTAL BASELINE

The environmental baseline is intended to provide a discussion of how the Steller sea lion came to be at its current status. The baseline considers factors that are related to human activities and those that are not. "Natural" factors include predation, disease, and environmental changes. Human-related factors include commercial harvesting, subsistence harvesting, fisheries impacts (Federal and State; including incidental take and intentional take), entanglement in marine debris, toxic substances, disturbance, research activities, and oil, gas, and mineral development. This section also includes a section on Federal fishery management actions already implemented.

A variety of factors have influenced the past trends of the western population, and those factors can and have changed over time. That is, no single factor can account for the entire decline. Evidence that one factor was influential does not rule out the possibility that other factors were also operating. Disease has the potential to cause a major decline but, to date, the available information does not link the decline to disease, and the geographically expansive and long-lived nature of the decline is not consistent with the expected expression of a major disease problem. In the 1970s and 1980s, incidental take accounted for the loss of a significant number of animals, but is no longer a significant problem. Intentional take is a matter of concern but can not be quantified at this time. Intentional take may still be a problem, although it is not expected to be as high as suggested for previous years. The commercial harvest of pups must have contributed to the decline of local populations where the harvests occurred, but does not explain the full long-term decline at those sites or the decline observed in other areas. Entanglement rates are relatively low for Steller sea lions and are not thought to be a problem. Increased predation has been suggested as a possible explanation for the decline, but this suggestion is supported only by very limited anecdotal data. Pollution may reduce reproduction or survival of sea lions, but the only scientific findings to date pertain to observed levels of various pollutants in the tissues of sea lions. Harassment has likely occurred in many areas and may have been very disruptive to sea lion colonies on rookeries or haulouts, thereby leading to redistribution of animals. Nevertheless, harassment is thought to be less common at present, and the data are not sufficient to demonstrate that harassment was a significant contributor to the decline. Harassment is also a less likely explanation in the remote areas of the sea lion range, where declines have been observed (e.g., central and western Aleutian Islands).

Climatic and oceanographic changes may have contributed significantly to the decline of Steller sea lions. Such changes could lead to reduced productivity to support prey populations, changes in community structure and composition, or changes in availability of prey species (i.e., all contributing to changes in carrying capacity). Since the late 1980s, considerably more information has become available on atmospheric and oceanographic changes in the Bering Sea and North Pacific, and this information provides evidence that some observed changes in community structure were related to changes in physical conditions in these ecosystems.

The hypothesis that lack of available prey may have contributed to the decline is based on studies of animals collected in the GOA in 1975-1978 and 1985-1986. These studies indicate changes in growth, condition, reproduction and survival - all findings consistent with nutritional stress. Additional studies also indicate a decline in juvenile survival. On the basis of this information, coupled with information on extensive trophic shifts in the BSAI and GOA regions, and the expansion of these fisheries, lack of available prey has become the leading hypothesis for the decline of the Steller sea lion.

EFFECTS OF THE ACTION

This section provides the analysis on which the conclusion of the opinion is based. The purpose of this section is to describe the direct, indirect, interdependent, and interrelated effects of the fisheries actions to determine if those fisheries, as implemented, may jeopardize the continued existence of the Steller sea lion or adversely modify its critical habitat.

The biological opinion begins by considering factors that are common to all three fisheries. Those factors, and a brief description of the major points, are as follows.

Uncertainty and risk

Much of the information in the opinion describes what we don't know about the problems being evaluated, as well as what we do know. The point is that the opinion will end with a conclusion based on the best available scientific and commercial data available, and it is important to recognize the strengths and weaknesses of that data in helping explain the Steller sea lion situation. There are risks associated with either conclusion (jeopardy or adverse modification versus no jeopardy or adverse modification). Those risks include a Type I error in which we might falsely conclude that the fisheries have a greater impact than they do, and a Type II error in which we falsely conclude that the fisheries do not have a significant impact when, in fact, they do. Any consideration of risks associated with the conclusions of this document should reconcile both of these types of errors.

Potential fisheries effects

Fisheries effects on marine mammals are generally split into operational effects (entanglement in gear, gear destruction, incidental catch or kill, etc.) and biological effects (competition for prey, changes to the size/age distribution of the target or prey species, changes to ecosystem composition, or disturbance of foraging patterns). This section of the report focuses on biological effects, as the information available suggests that operational effects are negligible at the population level.

The primary consideration is whether competition occurs between Steller sea lions and these three fisheries. We know that the fisheries operate in the areas where sea lions forage (e.g., critical habitat). We know that fisheries and sea lions consume both pollock and Atka mackerel, and the information in the opinion indicates that the sizes of pollock taken by sea lions overlaps with the sizes taken by the fishery. We also suspect that sea lions are limited by lack of available prey (as discussed above).

We are unable to describe in detail the nature and magnitude of the any competition that may occur between sea lions and the fishery (i.e., we are unable to determine if a "link" exists) because we are unable to describe the predator-prey dynamics of sea lions and Atka mackerel or pollock. Nevertheless, such links may exist. The opinion discusses two approaches to defining those links, and reasons why those approaches may have failed. In statistical and research terms, our investigative methods lack the power to detect significant links if they exist.

Diversity

The issue of diversity is discussed in two contexts. The first is the recent information suggesting that sea lion trends in 1990-1993 were related to diversity of prey taken. The results suggest that a diversity of prey is important for sea lions to recover. The second context pertains to the question of whether the pollock fisheries, in particular, may have played a past role in the trophic shift observed in the BSAI and GOA regions, or whether it may be a determinant of the future composition of these ecosystems.

Prey quality

Prey quality has become an issue in the Steller sea lion - fisheries debate largely because of the hypothesis suggested by Alverson (1991) that the shift from an ecosystem with a diversity of forage fishes to one dominated by pollock has reduced the quality of prey available to sea lions and may explain their decline. This hypothesis has become known as the "junk food hypothesis," although Alverson did not use that term. The implications of prey quality for sea lions are discussed in the context of this opinion and the information available on their diet.

Sensitivity to change, resilience, and recovery rate

The potential effects of fisheries on Steller sea lion are a function not only of the fisheries actions, but also of the characteristics of sea lions. In attempting to facilitate the recovery of this species, management must consider the ability of sea lions to tolerate various kinds of perturbation. The facts that the species has been declining for at least two decades without explanation and that we are unable to predict their trends even next year indicates that we do not understand their sensitivity to change. Resilience refers to their ability to recover when the perturbation has subsided and here, too, we know little about their resilience. Based on life history information, we can conjecture (with considerable confidence) that they are not likely to recovery at more than 10% per year, even under the best of conditions. This kind of information is important in providing a perspective on the nature and longevity of the recovery effort.

The winter season

The winter season has been a topic of considerable debate on matters related to the life history of Steller sea lions. The issue is whether the winter season is a period of particular sensitivity to change, particularly in food availability. The information available argues in an absolute sense, winter is a critical period, especially for adult females and young-of-the-year or juveniles. In a relative sense, however, similar arguments could also be made that other seasons are also crucial for a number of reasons. Winter is likely a crucial period, but food availability is necessary year round.

Adverse modification of critical habitat

The requirements of the Endangered Species Act (and section 7 in particular) are that the consultation consider not only the potential for an action to jeopardize the continued existence of a species, but that it also consider the potential for the action to destroy or adversely modify the habitat that has been designed as critical for that species. While these two considerations are not always the same, they are closely related in the case of potential fisheries interactions with Steller sea lions. Reduction in the prey available to food-limited sea lions through fishery removal of that prey constitutes competition, and also diminishes the value of the most important biological feature of critical habitat, its prey base. That prey base should be sufficient to support healthy, recovered sea lion populations.

Predator-prey dynamics, fishery effects, and links

Much of the uncertainty involved in this issue results from our poor understanding of predator-prey dynamics and the influence of fishing activities on those dynamics. Our current understanding of sea lions and their prey is progressing, but still rudimentary. Such uncertainty will likely persist into the near future. The lack of information neither proves nor disproves competition between sea lions and fisheries.

Scale and potential fishery effects

The issue of scale is fundamental to consideration of potential fisheries effects on sea lions. Management of the fisheries is intended to be conservative with respect to target species and the entire ecosystem. Nevertheless, fishery management parameters such as the total allowable catch, the overfishing level, and the overall harvest rate are generally evaluated on a stock-wide basis. This is consistent with the so-called "single-species" approach, and when combined with accurate and reliable stock assessment methods may be considered a useful approach to the management of the target species. However, additional constraints are placed on fisheries to take into account the potential for ecosystem effects that may result from excessive localized depletion or excessive bycatch (particularly of prohibited species). Time-area measures are used to disperse fishing effort and catch and prevent concentration of detrimental effects in time or space. The use of management areas and seasons are examples of time-area measures. Closed areas are also used to prevent detrimental effects either on the target species in certain parts of its range (e.g., areas closed to herring fishing) or to prevent detrimental effects on other components of the ecosystem (e.g., protective no-trawl zones around Steller sea lion rookeries). The purpose of these measures is to scale the potential detrimental effects of fishing that may be caused by concentrated harvesting to the tolerance of either the target species or other elements of the ecosystem.

Effects specific to each of the three fisheries

Evaluation of each of the three fisheries indicates that they may lead to detrimental effects due to concentration of effort either in time or space. The Atka mackerel fishery has been concentrated spatially and temporally with 70% or more of its total catch coming from Steller sea lion critical habitat, and the majority of the catch coming in January to March or April. The Council voted in June to disperse this fishery by establishing two seasons and reducing the percent of TAC caught in critical habitat to 40% in areas 542 and 543 over the next 4 years.

The BSAI pollock fishery has become concentrated in time and space. Since 1990, the fishery has gone from nearly 10 months per year to about 3 months or less in recent years. Much of that effort is focused in the winter months (Fig. 14). The fishery has also become concentrated in Steller sea lion critical habitat (Figs. 12, 15), which overlaps considerably with the catcher vessel operation area (CVOA; Figs. 16,17). Removal rates from the CVOA during the B season have approached 50% in 1997, and in the four years when harvest rates could be estimated (1991, 1994, 1996, 1997), those rates in the B season CVOA exceeded overall harvest rates by at least a factor of 2. Similar rates can not be calculated for other years or for the A season because survey information is not available for those years, particularly in the winter or A season. Pollock are thought to be aggregated for spawning in the late winter, but without survey information, the potential for concentrated harvesting can not be evaluated.

The GOA pollock fishery is more dispersed in time than the GOA pollock fishery(Fig. 14), but has been concentrated in Steller sea lion critical habitat since the discovery of the pollock

spawning aggregation in Shelikof Strait in the early 1980s (Figs. 13 and 15). Since 1982, 50% to 90% of the pollock catch has come from critical habitat. If the fish stock is distributed such that 50% to 90% of the stock is located within critical habitat, then such harvesting may not be concentrated relative to the stock distribution, and may therefore be less likely to have detrimental ecosystem effects. In the GOA, harvest rates in most areas can not be calculated as the survey information is not available to determine the distribution of stock biomass.

CONCLUSION

The information and analyses in the biological opinion are required to determine if the fisheries, as implemented, are reasonably likely to either jeopardize the continued existence of the western population of Steller sea lion or destroy or adversely modify its critical habitat. The Regional Administrator for the Alaska Region will make his recommendation to the Chief of the Office of Protected Resources, who is responsible for the final decision. The decision is not final until signed by the Chief of the Office of Protected Resources. The opinion is expected to be signed on or before December 16, 1998.

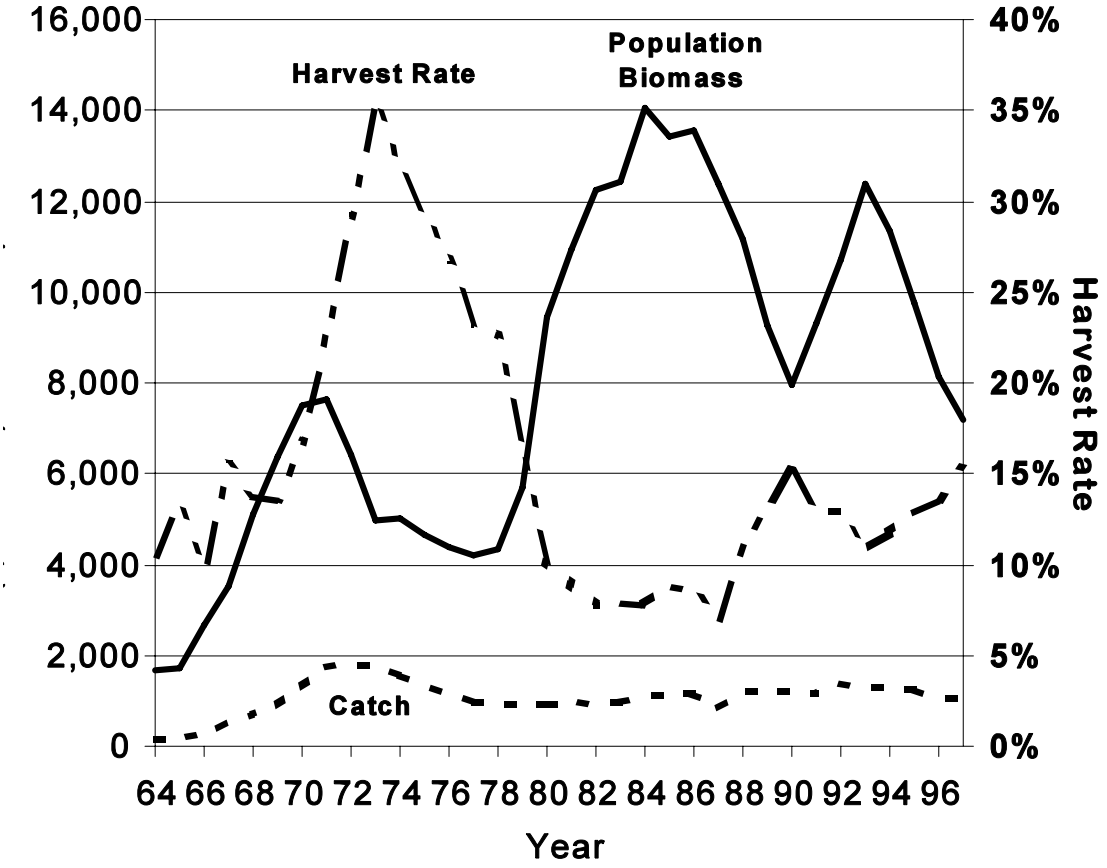

Figure 10. Population biomass, catch and harvest rate of EBS pollock from 1964 to 1997.

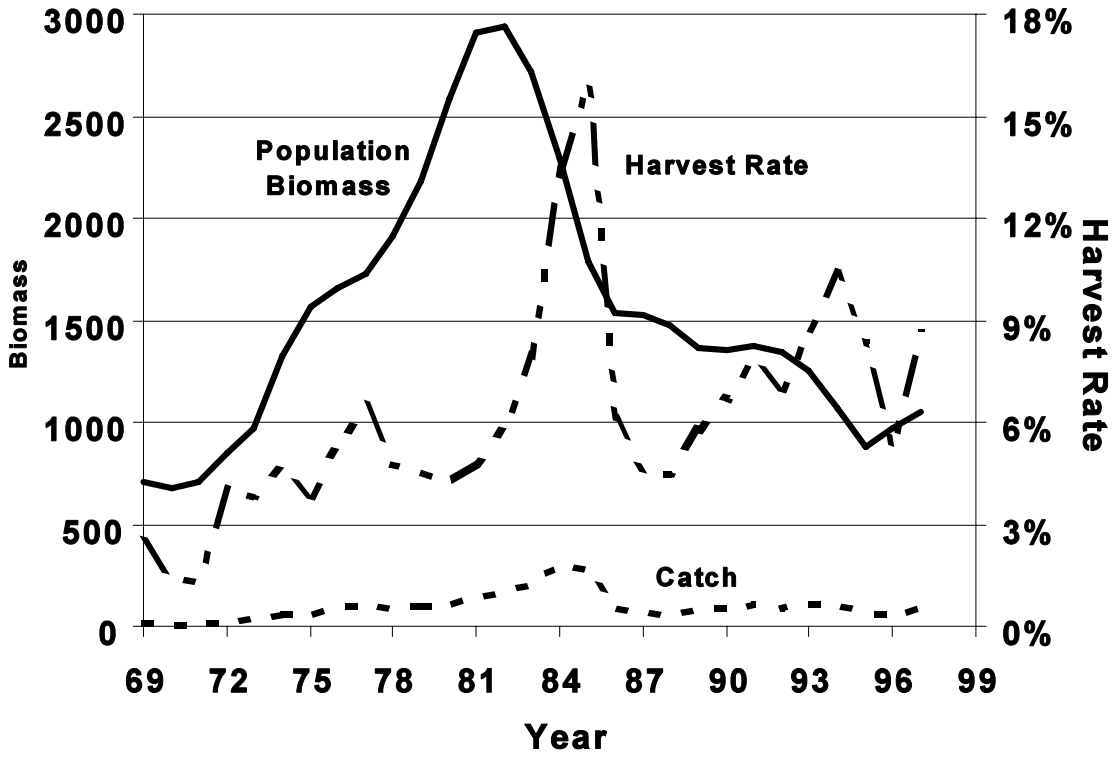

Figure 11. Population biomass, catch and harvest rate of GOA pollock from 1969 to 1997.

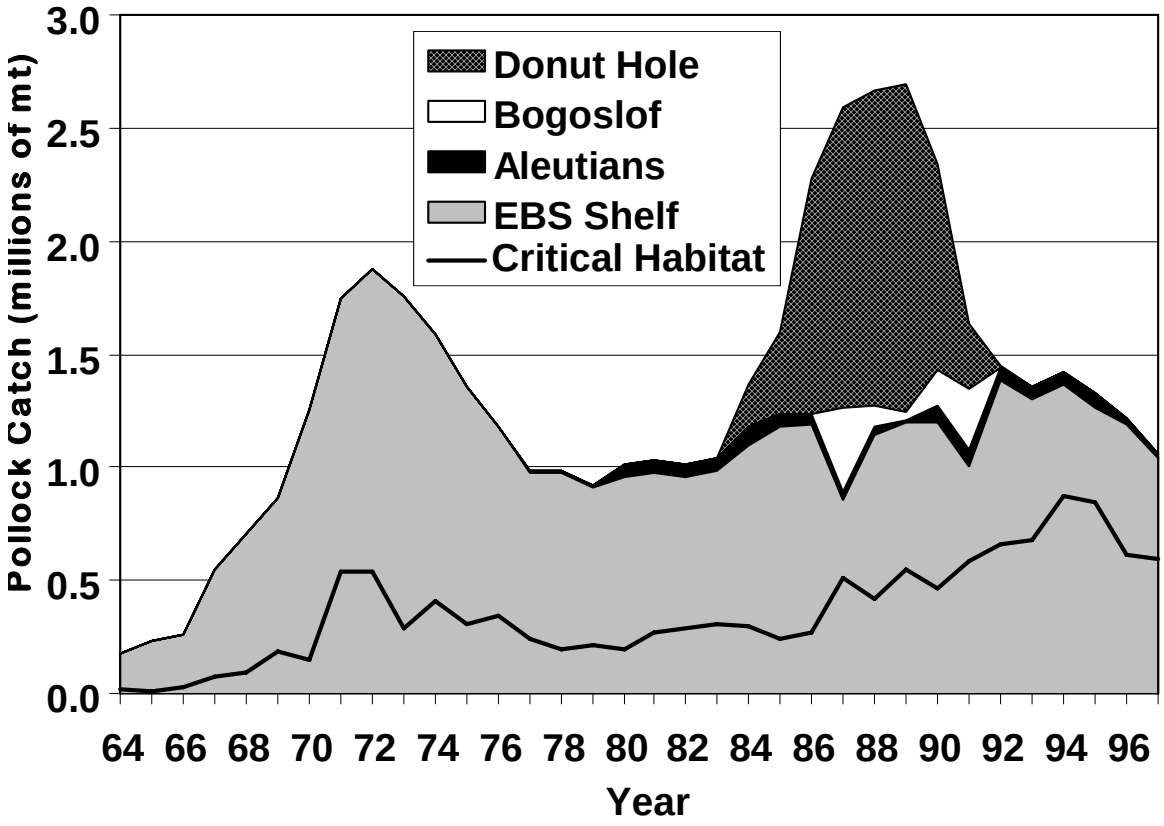

Figure 12. Catch of walleye pollock (mmt) in the eastern and central Bering Sea and Aleutian Islands from 1964 to 1997. Catch of pollock is shown in the following regions: (1) the Donut Hole, or international waters outside of the US EEZ in the central Bering Sea; (2) Bogoslof Island area in the US EEZ, a spawning area for the Donut Hole stock; (3) Aleutian Island area west of 170° W longitude and south of 55°N latitude in the US EEZ; (4) eastern Bering Sea (EBS) shelf, and (5) Steller sea lion critical habitat within the Bering Sea/Aleutian Island region. Regions 2-4 above sum to the total BSAI pollock catch within the US EEZ, while the catch within critical habitat is a portion of this total.

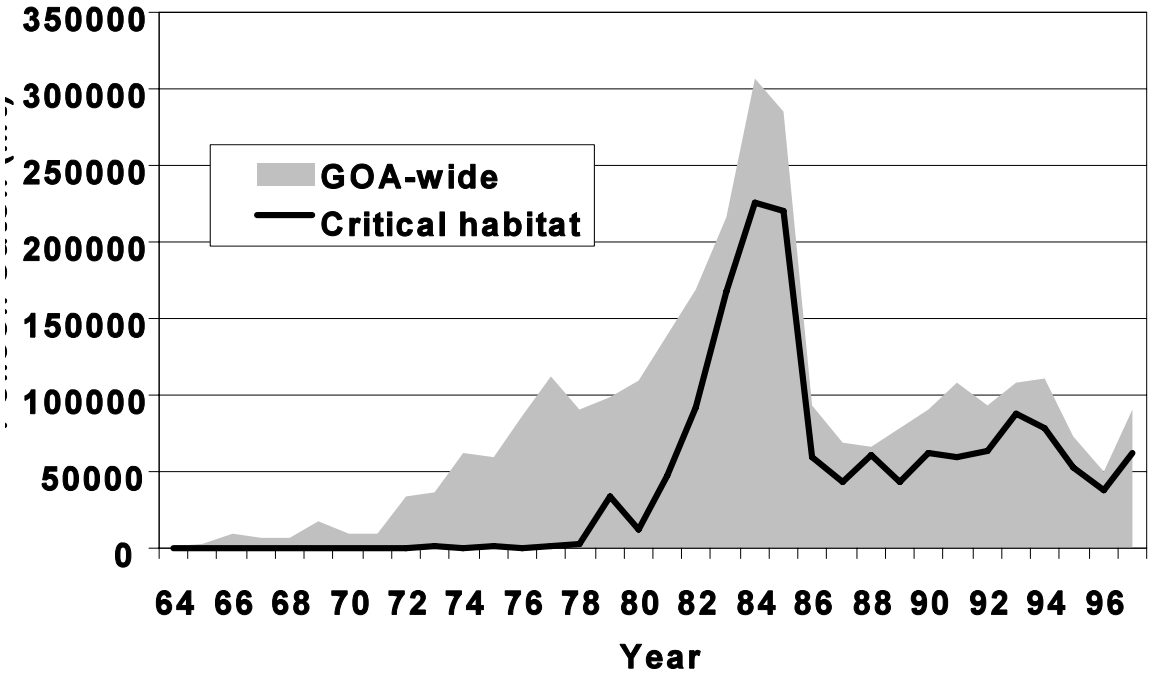

Figure 13. Catch of walleye pollock (mt) in the GOA and in GOA Steller sea lion critical habitat from 1964 to 1997.

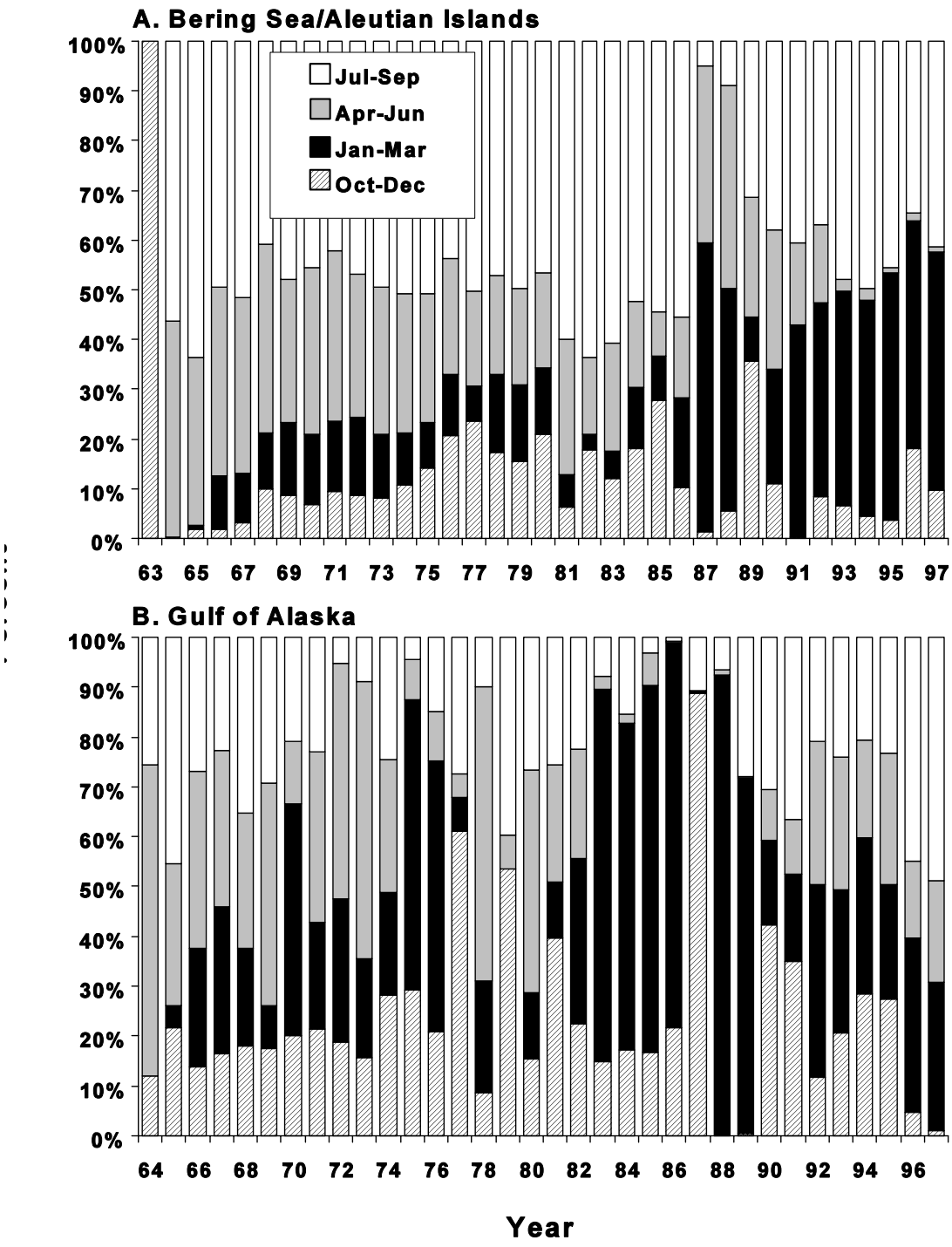

Figure 14. Quarterly distribution of pollock catch in the eastern Bering sea and Aleutian Islands (A) and the GOA (B) from 1963 to 1997.

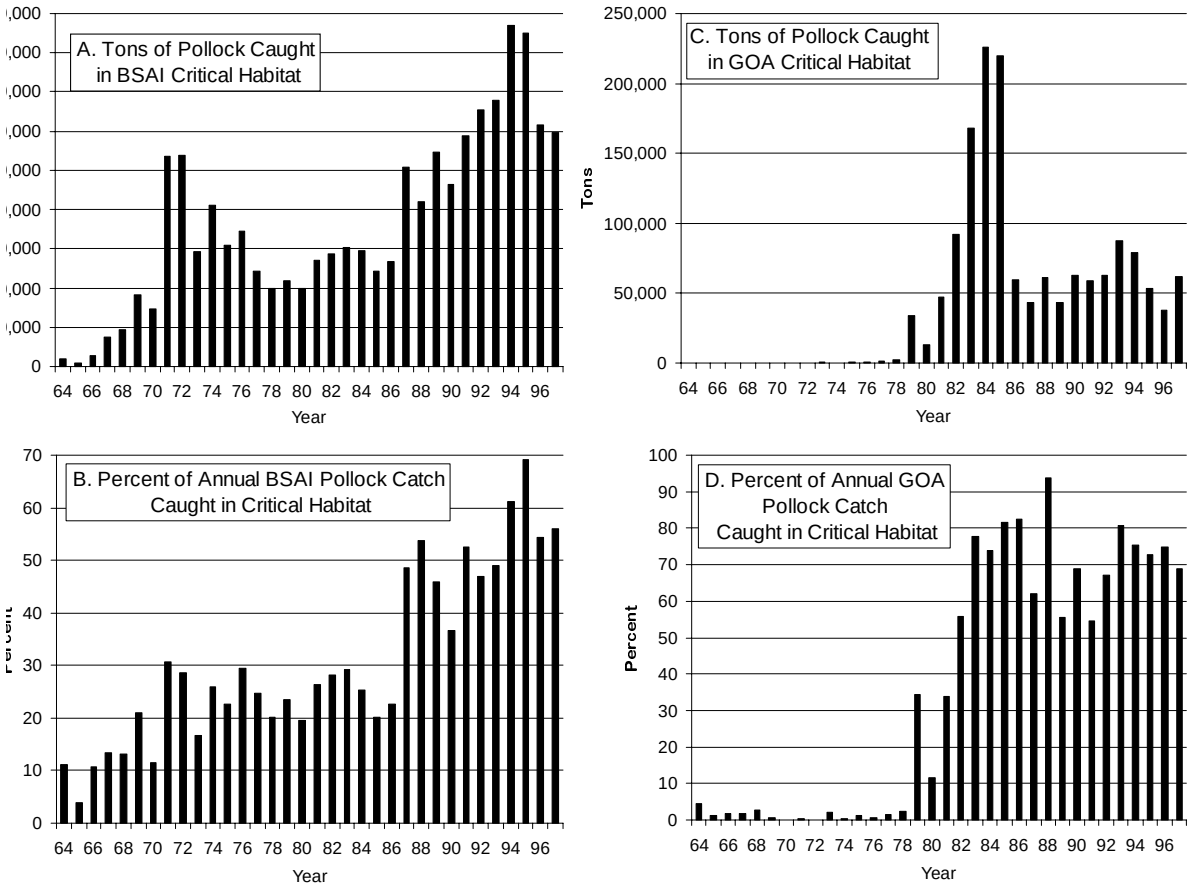

Figure 15. Catch (tons; A and C) and percent of annual regional catch of pollock (B and D) from Steller sea lion critical habitat in the BSAI (A and B) and GOA (C and D) from 1964 to 1997.

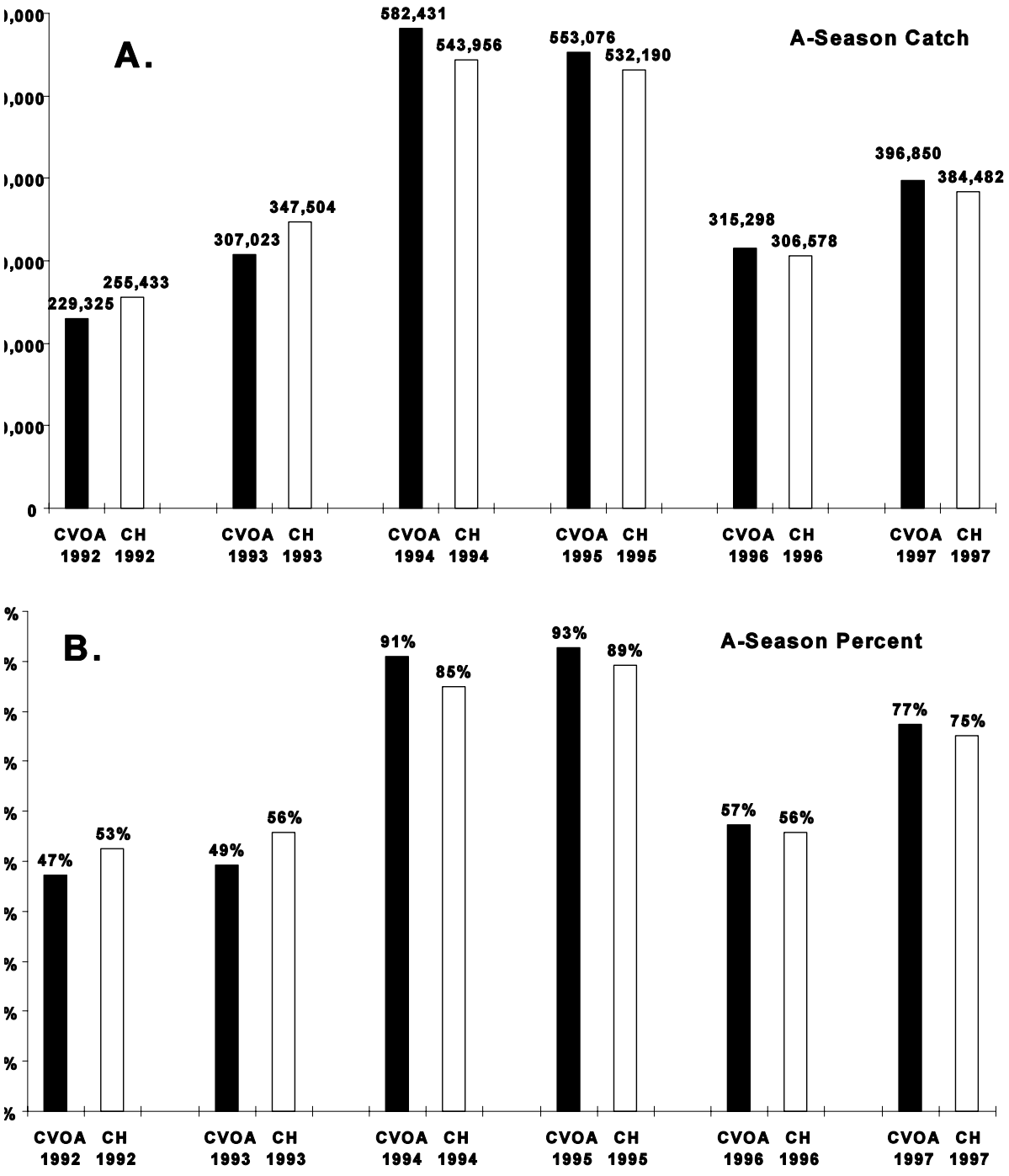

Figure 16. A-season catches (A; in mt) of pollock in the BSAI in 1992 to 1997 in the Catcher Vessel Operational Area (CVOA) and in Steller sea lion critical habitat. Percent of total A-season BSAI pollock catch is shown in B.

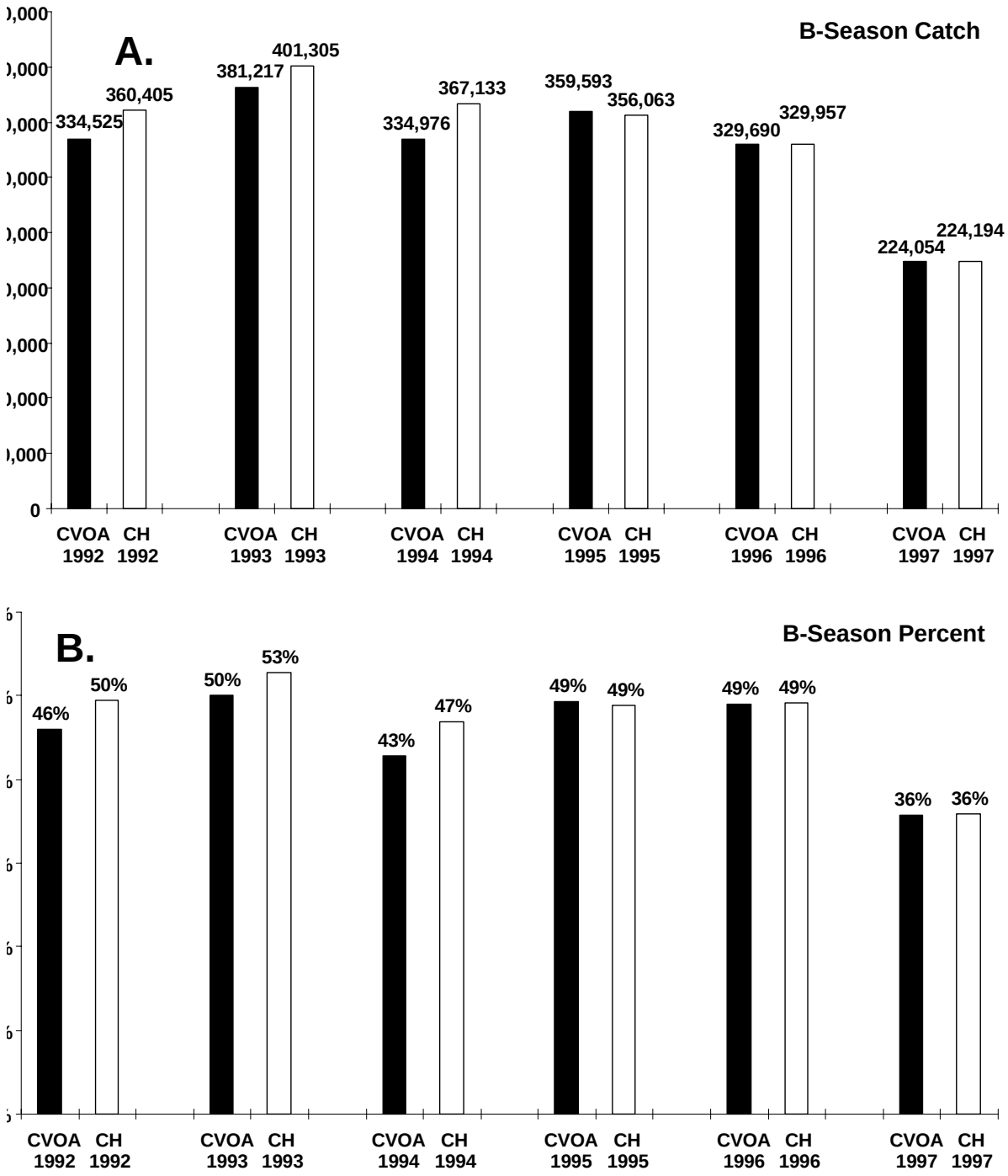

Figure 17. B-season catches (A; in mt) of pollock in the BSAI in 1992 to 1997 in the Catcher Vessel Operational Area (CVOA) and in Steller sea lion critical habitat. Percent of total B-season BSAI pollock catch is shown in B.

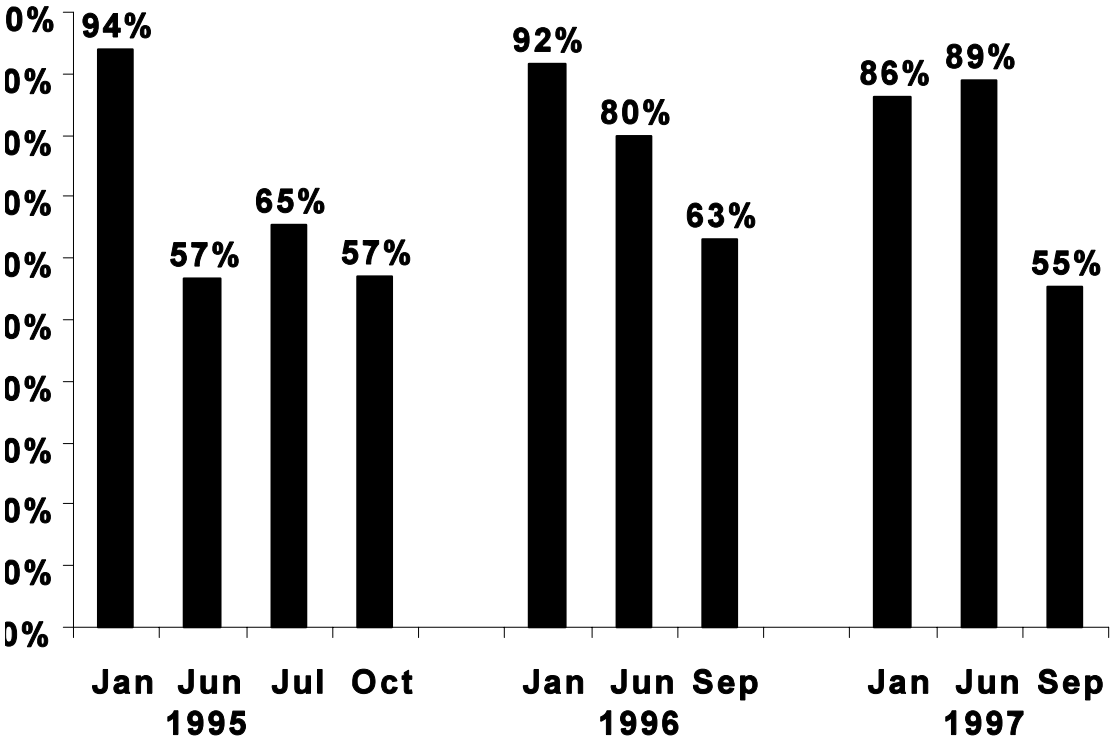

Figure 20. Percentage of observed pollock catch caught within Steller sea lion critical habitat in the GOA pollock fisheries in 1995 to 1997, by season.

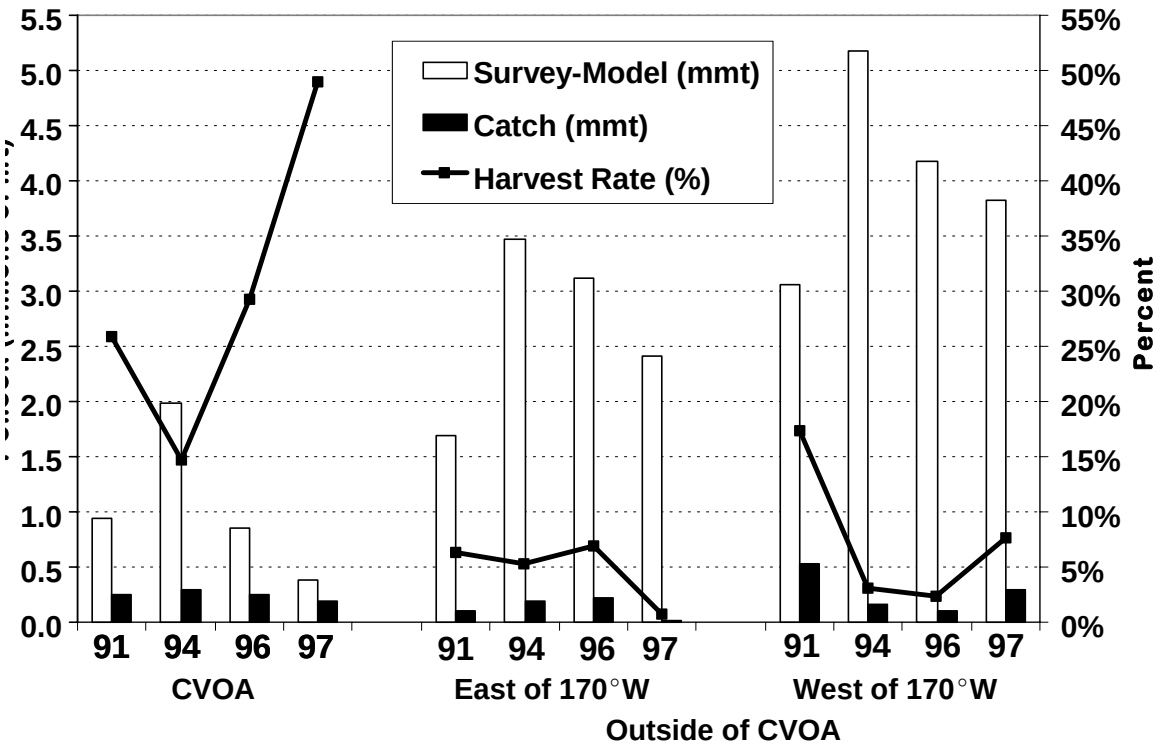

Figure 25. Distributions of age 3+ pollock biomass (mmt) from the combined bottom trawl and hydroacoustic surveys and the 1997 stock assessment, commercial catches of pollock (mmt) from observer and blend data, and pollock harvest rates (% caught) by area in the B-seasons of 1991, 1994, 1996, and 1997.

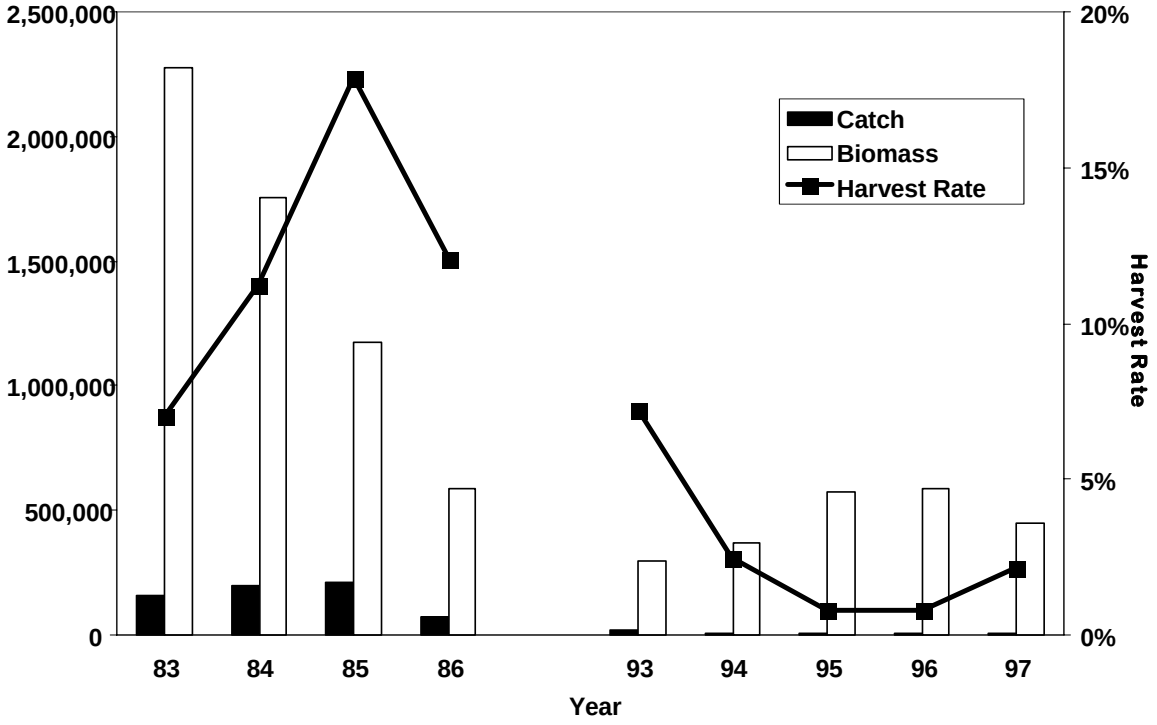

Figure 26. Estimated catch and biomass of pollock in Shelikof Strait in January-March of 1983-86 and 1993-97. Catch was estimated using observer and blend data. Biomass is from echo-integration midwater trawl surveys of the spawning aggregation in Shelikof Strait. Harvest rate=catch/biomass.

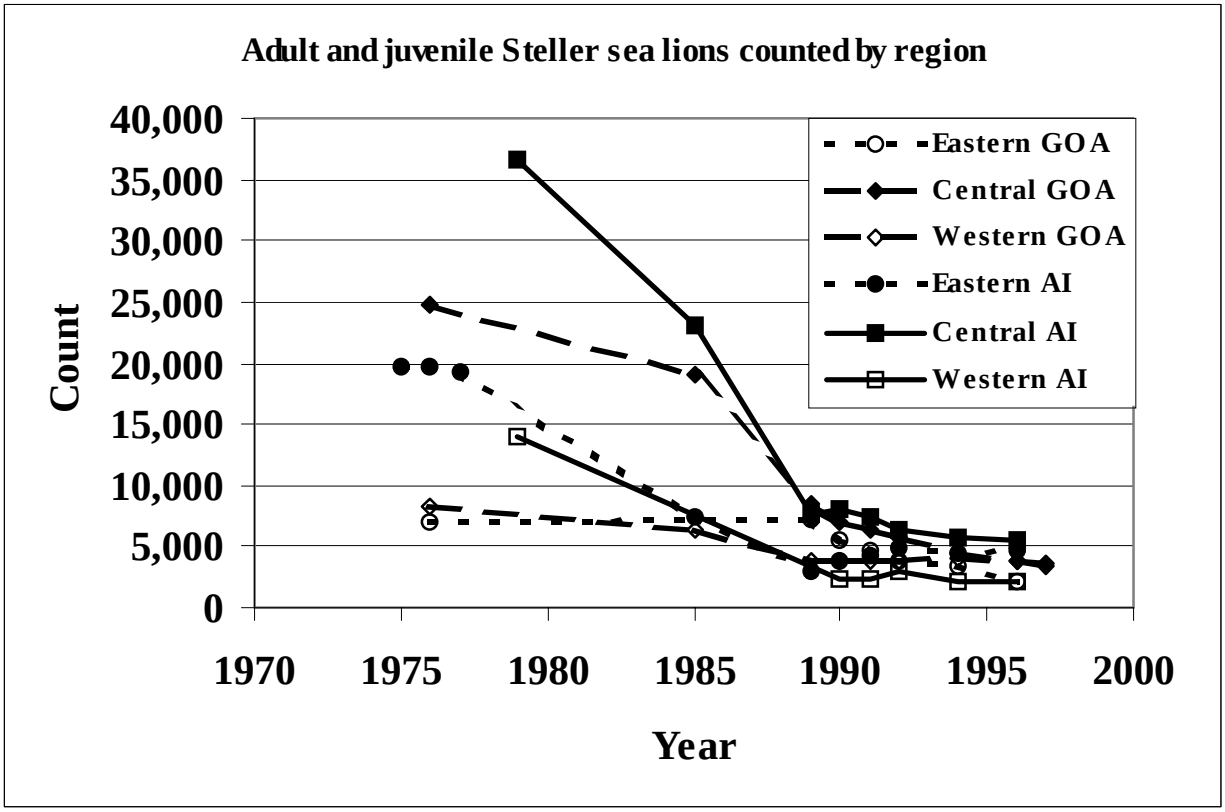

Figure 33. Counts by region of adult and juvenile Steller sea lions in the western population.